UNIVERSITI PUTRA MALAYSIA

PREVALENCE OF METABOLIC SYNDROME AND FACTORS ASSOCIATED WITH IT AMONG WOMEN IN FELDA PALONG, GEMAS, NEGERI SEMBILAN

AZIZAH BTE MAT HUSSIN

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By

Azizah Bte Mat Hussin

Thesis Submitted to the School of Graduate Studies University Putra Malaysia in Fulfilment of the Requirement for the Degree of Master of Science

December 2006

Dedicated to:

My beloved parents (Mat Hussin B Anal and Wan Aminah Bte Wan Yaacob) for their love and care throughout my Master study.

My lovely siblings (Asma, Azlina, Aminudin, Azmanida) for their encouragement and understanding.

My supportive family members

My dearest Hafazli Burhan

And

My wonderful friends for their assistance.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Master of Science

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December 2006

Chairman: **Associate Professor Rokiah Bte Mohd Yusof, PhD**

Faculty: **Medicine and Health Sciences**

A cross sectional study was carried out to assess the diet, physical activity and the prevalence of metabolic syndrome (MS) of 106 women aged 45 to 60 years old living in Felda Palong 4, 5 and 6, Gemas, Negeri Sembilan. The data collection processes included interviews, anthropometric measurements, blood pressure measurements and blood lipid sample collection. Out of the total sample, 67.0% were Malays, 29.2% were Indians and 3.8% were Chinese. The educational level of respondents (37.7%) was primary school level. Most of the respondents were housewives (70.8%), with a majority of the respondents (60.4%) earning between RM400 and RM699 per month. For the anthropometric measurements, almost half of the respondents (47.2%) were overweight (Body Mass Index (BMI) ≥ 25.0 - 29.9). Majority of the respondents (74.5%) had waist-

hip-ratio (WHR) of more or equal to 0.85 and 81.1% had waist circumferences (WC) equal to or greater than 80 cm. The prevalence of hypercholesterolemia (total cholesterol (TC) ≥ 6.2mmol/L) among respondents was 31.1%. Raised Low Density Lipoprotein- Cholesterol (LDL-C) was found in 43.4% of the respondents while low levels of High Density Lipoprotein- Cholesterol (HDL-C) were evident in 14.2% of the respondents. The prevalence of high blood pressure and high blood glucose were 47.2% and 21.7% respectively. The dietary pattern of the respondents showed that their main sources of carbohydrate were rice and white bread. Their main sources of protein were chicken and fish while their sources of vitamins and minerals were fruits and vegetables. A high percentage of respondents were deficient in nutrients like potassium, vitamin C, fiber and calcium that were found to be lower than the Malaysian Recommended Nutrient Intake (RNI) and Daily Reference Value (DRV). On the other hand, the mean intakes of protein, carbohydrates, total fat, sodium, vitamin A, vitamin E and iron were found to be more than RNI and DRV. For physical activity, the mean kcal spent for physical activity was 1843±355. Most of the respondents (55.7%) were in the category of moderate PAL. By using International Diabetes Federation (IDF) criteria, the prevalence of metabolic syndrome significantly increased from 48.1% (NCEP ATPIII) to 54.7% ($r = 0.724$, $p<0.01$). Respondents with metabolic syndrome had significantly higher mean BMI, WC, WHR, systolic blood pressure (SBP), diastolic blood pressure (DBP), fasting plasma glucose (FPG), LDL-C and lower mean of HDL-C. BMI, WHR, SBP, DBP, FPG,

triglycerides and HDL-C were found to be significantly associated with MS. The mean energy intake was 1846±450 kcal for subjects with MS and 1927±521 for subjects without MS, both lower than the Malaysian RNI (2180 kcal for female). Respondents with MS had higher protein, carbohydrate, total fat and sodium intakes whereas respondents without MS had higher energy intake, cholesterol, vitamin A, vitamin C, potassium, fiber, calcium and iron intakes. However, these differences were not statistically significant except for vitamin C ($p<0.05$). The results showed that intake of iron, sodium and total fat were significantly associated with metabolic syndrome while protein, vitamin A, vitamin C, calcium and fiber intake were not significant. In conclusion, this study found that there were associations between anthropometric measurements, blood pressure, fasting plasma glucose and lipid profiles with metabolic syndrome. This study also found that there were associations between certain nutrient intakes and physical activity with metabolic syndrome. Therefore, there is a need to address these problems at national and regional level with the aim of early identification and prevention and appropriate community based intervention program should be reinforced to increase the awareness of the community on healthy living.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PREVALENS METABOLIK SINDROM DAN FAKTOR-FAKTOR YANG BERKAITAN DENGANNYA DI KALANGAN WANITA DI FELDA PALONG, GEMAS, NEGERI SEMBILAN

Oleh

AZIZAH BTE MAT HUSSIN

Disember 2006

Pengerusi: **Professor Madya Rokiah Mohd Yusof, PhD**

Fakulti: **Perubatan dan Sains Kesihatan**

Satu kajian keratan rentas dijalankan untuk mengkaji pemakanan, aktiviti fizikal dan prevalens metabolik sindrom (MS). Kajian ini telah dijalankan di kalangan 106 wanita yang berumur di antara 45 hingga 60 tahun dan tinggal di Felda Palong 4, 5 dan 6, Gemas, Negeri Sembilan. Proses pengumpulan data termasuk temubual, pengukuran antropometri, tekanan darah dan pengambilan sampel darah. Kebanyakan responden (67.0%) adalah Melayu, 29.2% India dan 3.8% Cina. Secara purata, tahap pendidikan responden adalah sekolah rendah (37.7%). Majoriti responden (70.8%) adalah surirumah dengan pendapatan isirumah antara RM400 hingga RM699 sebulan. Untuk pengukuran antropometri, hampir separuh dari jumlah responden (47.2%) adalah di dalam kategori berlebihan berat badan (Indeks Jisim Tubuh (IJT) ≥ 25.0 - 29.9). Distribusi nisbah pinggang-

pinggul (NPP ≥ 0.85) dan ukuran pinggang (UP ≥ 80cm) adalah masing-masing 74.5% dan 81.1%. Distribusi hiperkolestrolemia (Jumlah Kolesterol (JK) ≥ 6.2mmol/L) di kalangan responden adalah 31.1%. Paras Kolesterol Lipoprotein Ketumpatan Rendah (K-LKR) yang tinggi didapati di kalangan 43.4% responden sementara paras Kolesterol Lipoprotein Ketumpatan Tinggi (K-LKT) yang rendah terbukti di kalangan 14.2% responden. Distribusi tekanan darah dan glukosa darah yang tinggi adalah masing-masing 47.2% dan 21.7%. Corak pemakanan menunjukkan sumber karbohidrat responden adalah dari nasi dan roti putih manakala sumber protein adalah dari ayam dan ikan. Sayur-sayuran dan buah buahan adalah sumber utama vitamin dan mineral responden. Kajian ini juga menunjukkan peratusan yang tinggi terhadap kekurangan nutrien seperti potasium, vitamin C, serat dan kalsium di mana ia didapati kurang daripada RNI Malaysia dan DRV. Manakala purata protein, karbohidrat, lemak, sodium, vitamin A, vitamin E dan zat besi didapati melebihi RNI Malaysia dan DRV. Untuk aktiviti fizikal, min aktiviti fizikal adalah 1.43±355. Majoriti responden (55.7%) adalah di dalam aras aktiviti fizikal sederhana. Dengan menggunakan kriteria dari *International Diabetes Fedaration (IDF)*, prevalens MS meningkat secara signifikan dari 48.1% (kriteria dari *National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII)*) kepada 54.7% ($r=0.724$, $p<0.01$). Responden dengan MS mempunyai perbezaan yang signifikan untuk purata IJT, UP, NPP, tekanan darah sistolik dan diastolik, glukosa darah, K-LKR dan K-LKT. IJT, UP, NPP, tekanan darah, paras glukosa darah,

trigliseride, dan K-LKT didapati mempunyai perkaitan yang signifikan dengan MS. Purata pengambilan tenaga di kalangan responden MS adalah 1846±450 kkal manakala 1927±521 untuk responden bukan MS, kedua-duanya adalah lebih rendah dari RNI Malaysia (2180 kkal untuk wanita). Responden dengan MS mempunyai pengambilan protein, karbohidrat , lemak dan sodium yang lebih tinggi manakala responden tanpa MS mempunyai pengambilan tenaga, kolesterol, vitamin A, vitamin C, potassium, serat, kalsium dan zat besi yang tinggi. Walau bagaimanapun, perbezaan pengambilan nutrien di kalangan responden dengan MS dan tanpa MS adalah tidak signifikan kecuali vitamin C ($p<0.05$). Kajian ini menunjukkan zat besi, sodium dan lemak mempunyai perkaitan yang signifikan dengan MS manakala protein, vitamin A, vitamin C, kalsium dan serat didapati tidak signifikan. Secara kesimpulannya, kajian ini mendapati perkaitan antara pengukuran antropometri , tekanan darah, paras glukosa darah dan profil lipid dengan MS. Kajian ini juga mendapati ada perkaitan antara nutrien-nutrien tertentu dengan MS. Oleh itu, adalah suatu kepentingan kepada pihak berwajib untuk mengenalpasti masalah ini dari peringkat daerah khususnya dan kebangsaan amnya. Pengesanan awal, pencegahan serta program berasaskan komuniti yang bersesuaian perlu dilakukan untuk meningkatkan kesedaran komuniti terhadap kehidupan yang sihat.

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Azizah Bte Mat Hussin

I certify that an Examination Committee has met on 20 December 2006 to conduct the final examination of Azizah Bte Mat Hussin on her Master of Science thesis entitled "Prevalence of Metabolic Syndrome and Associated Factors Among Women in Felda Palong, Gemas, Negeri Sembilan" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are follows:

Mirnalini Kandiah, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Mohd Nasir Mohd Taib, PhD
Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Latiffah Abd Latif, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Fatimah Arshad, PhD
Professor
Faculty of Allied Health Sciences
Universiti Kebangsaan Malaysia
(External Examiner)

HASANAH MOHD. GHAZALI, PhD
Professor/Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 22 MARCH 2007

This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

Rokiah Mohd Yusof, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Zaiton Yassin, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Nawalyah Abdul Ghani, MSc
Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

AINI IDERIS, PhD
Professor/Dean
School of Graduate Studies,
Universiti Putra Malaysia

Date: 12 APRIL 2007

DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citation which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

AZIZAH BTE MAT HUSSIN

Date: 23/08/07

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LIST OF ABBREVATIONS

AACE	American Association of Clinical Endocrinologists
ADA	American Diabetes Association
AHA	American Heart Association
BMI	Body Mass Index
BMR	Basal Metabolic Rate
BP	Blood Pressure
CHD	Coronary Heart Disease
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
DHA	Docosahexanoic Acid
DM	Diabetes Mellitus
DRI	Dietary References Intake
DRV	Daily Reference Value
EPA	Eicosapentanoic Acid
Etc	Et cetera
FFQ	Food Frequency Questionnaire
FPG	Fasting Plasma Glucose
HBP	High Blood Pressure
HDL-C	High Density Lipoprotein Cholesterol
HOPE	Heart Outcomes Prevention Evaluation Trial
hr	Hour

IDF	International Diabetes Federation
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerance
IJT	*Indeks Jisim Tubuh*
IR	Insulin Resistance
IRPA	Intensification of Research in Priority Area
EGIR	European Group for the Study of Insulin Resistance
JK	*Jumlah Kolesterol*
JNCVII	7th Joint National Committee
K-LKR	*Kolesterol Lipoprotein Ketumpatan Rendah*
K-LKT	*Kolesterol Lipoprotein Ketumpatan Tinggi*
LDL-C	Low Density Lipoprotein Cholesterol
MS	Metabolic Syndrome
MUFA	Monounsaturated Fatty Acid
NCEP ATPIII	National Cholesterol Education Program Adult Treatment Panel III
NEFA	Non-esterified fatty acid
NHMSI	First National Health and Morbidity Survey
NHMSII	Second National Health and Morbidity Survey
NHMSIII	Third National Health and Morbidity Survey
NO	Nitric Oxide
NPP	*Nisbah Pinggang Pinggul*
OR	Odds Ratio

Ox-LDL	Oxidative modified low density lipoprotein
PAL	Physical Activity Level
PAR	Physical Activity Ratio
PIKAM	*Projek Intervensi Kardiovaskular Malaysia*
PUFA	Polyunsaturated Fatty Acid
RDA	Recommended Dietary Allowance
RNI	Recommended Nutrient Intake
SBP	Systolic Blood Pressure
SD	Standard Deviation
SFA	Saturated Fatty Acid
SPM	*Sijil Pelajaran Malaysia*
SRP	*Sijil Rendah Pelajaran*
STPM	*Sijil Tinggi Pelajaran Malaysia*
TC	Total Cholesterol
TEE	Total Energy Expenditure
TFA	Trans Fatty Acid
TG	Triglycerides
TONE	Trial of Nonpharmacologic Interventions in the Elderly
UP	*Ukuran Pinggang*
VLDL	Very Low Density Lipoprotein
WC	Waist Circumferences
WHO	World Health Organization